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# FOUR CORNERS GEOLOGICAL SOCIETY

## October 2023

## OCTOBER 2023 MEETING

SPEAKERS: **STEVE KELLER, Colorado Geological Survey**

TITLE: **A Chronology of Research on the Castle Rock Conglomerate**

DATE: Thursday October 19, 2023

TIMES: 5:30 - 6:30 pm: Social Hour and Buffet Dinner  
6:30 pm - 7:30 pm: Society Business / Presentation  
7:30 - 7:45 pm: Raffle to raise money for students

**Zoom link is: [LINK to Meeting](#)**

Zoom starts at 6:30 pm

LOCATION **Vallecito Room, Student Union Building**  
Fort Lewis College. Dinner served @ ~ 5:30 - 6:30 pm

COST: \* \$20/person. **MEMBERS: Please RSVP by Noon Tuesday, October 17th.** \*\* **PLEASE go to the website** to pay (preferred) or RSVP online (planning to attend). Do not call David. Catering requires advance notice of how many dinners to make and we pay accordingly. <https://fourcornersgeologicalsociety.org/event>. \* **STUDENTS & FACULTY ONLY:** You need to RSVP by email to Dr. David Gonzales at [gonzales\\_d@fortlewis.edu](mailto:gonzales_d@fortlewis.edu). At least 15 students will be sponsored. All faculty (members) are sponsored.



## **Abstract:**

# ***Investigations in the Late Eocene Castle Rock Conglomerate, 1869 to the Present, Including Recent Research on Its Diagenesis***

**Stephen M. Keller: Colorado Geological Survey**

**Mark Longman: Denver Museum of Nature & Science**

The late Eocene Castle Rock Conglomerate occurs in the southwest part of the Denver Basin, mostly in Douglas and Elbert Counties, and is the youngest Cenozoic unit in that area. The formation exists as a swath of unconnected erosional remnants, trending northwest to southeast approximately from Sedalia to Calhan. The swath is ~65 km long and is ~3 km wide in the northwest and ~10 km wide in the southeast. The formation is well exposed and topographically prominent, forming flat mesas, steep cliffs, and narrow canyons. It is a fluvial unit deposited by a wide braided-stream system, and depositional features such as large-scale cross bedding, massive bedding, large angular tuff blocks, other clast lithologies, incised channels, fining-upward sequences, and fossil logs are readily

observable. Brontothere fossils are present but rare. Because the conglomerate is geologically and scenically striking it has interested geologists since the late 1860s. Because of improved access to the unit over the last 60 years (in Castlewood Canyon State Park and in county and municipal open spaces), it has increasingly attracted educators, students, and the public. This talk will present a chronology of geologic investigations (description, nomenclature, mapping, and paleocurrent studies) in the unit, and summarize deposition, geologic history, and age as presented by various investigators over the last century and a half, including recent work. The talk also will treat recent research on the formation's diagenesis. There are two major diagenetic cements: an older opal cement forming coatings of fairly uniform thickness around the grains and precipitating before any grain compaction; and a younger chalcedony cement partially filling the pores between the grains and precipitating after opal cementation ceased. The cementation causes the conglomerate to be well indurated and resistant to erosion. The cements were derived, at least in part, from the Wall Mountain Tuff, which was incised by the conglomerate and clasts of which are common in the formation.



Tcr at Castlewood Canyon State Park;  
paleoflow in orange layer is from left to right



## Our Authors:

### **Steven M. Keller, Colorado Geological Survey**

Steve received a B.A. (1972) and an M.S. degree (1974) in geology from the State University of New York and a Professional Master's degree (1992) in hydrogeology from the Colorado School of Mines (CSM). From 1975 through 2013 he was employed in geologic mapping, minerals exploration and consulting, the Yucca Mountain Project, and environmental site investigation. Steve's association with the Colorado Geological Survey (CGS) began in 2006 and has included a comprehensive paleocurrent study (with Matt Morgan, present CGS Director) of the Castle Rock Conglomerate. Since 2016 he has been the lead CGS mapper for seven 7.5' quadrangles in the northern Colorado Piedmont (mainly late Quaternary alluvial and eolian deposits) and is currently the lead on a Quaternary geologic map compilation of that area. Since 2013 he has given a Van Tuyl lecture at CSM, Geological Society of America (GSA) conference talks, led a GSA field trip in the Castle Rock Conglomerate, and served as field trip co-chair for the GSA 2016 conference in Denver.



### **Mark Longman, Denver Museum of Nature and Science**

Mark received his B.A. degree from Albion College (Michigan) in 1972 followed by a Ph.D. in Geology from the University of Texas at Austin in 1976. He then joined the research lab of Cities Service Company in Tulsa, Oklahoma for five years before moving to Denver in 1981 to work for Coastal Oil and Gas Company as an exploration geologist in the Williston Basin. From 1984 to 2006, he was a consulting geologist before joining QEP Resources, where he worked as their "Rock Expert" until 2018. Mark then joined the Denver Museum of Nature and Science as a Research Associate and continues to work on various projects with the Museum including his recent work on the Castle Rock Conglomerate. He specializes in the description of cores, outcrops, and petrographic thin sections with a focus on integrating sedimentology and petrology to interpret depositional environments and diagenesis.



[ZOOM LINK: here](#)





**Investigations in the Late Eocene  
Castle Rock Conglomerate**



**Tcr massive layer overlain by trough cross-bedded layer; Prairie Canyon Open Space**



**Giant trough in Tcr trough cross-bedded layer; paleoflow is to upper right**



**Tcr trough cross bedding; paleoflow is from right to left**



**Tcr trough cross bedding at Castlewood Canyon State Park; paleoflow is toward viewer.**



# "PREZ SEZ" by Chris Heine

Hello FCGS Members!



As I said in my August Prez Sez, my personal rock/mineral collection is growing. The Society had two field trips this September. Trip one, an overnight in Bluff was needed to cover the 4-Corners Morrison fieldtrip where we touched New Mexico, Arizona, Utah and Colorado. I didn't fill my pockets with hand specimens, but did fill a memory card with images. I'm sure photos will be included in this newsletter. We were blessed by the weather gods. On Saturday, the rain was all around us but we saw only a drop or two while in the field. The rain came

in earnest as dinner was served at the Sand Island camp site where we were under cover. Those of us staying at the Recapture Lodge in Bluff listened to the rain through open windows, those camping at Sand Island weren't as lucky. Sunday began with student prepared breakfast burritos and cowboy coffee, a great start to a perfect day. Sunday ended with a climb at a location behind the Battle Rock Charter School where we got to see some impressive Morrison Formation dinosaur bones.

The second field trip to Ironton was organized primarily for alumni including non-geologists. Dr. David Gonzales led the trip with 32 participants of all backgrounds and experience levels. Again, the weather was perfect, a chilly start gave way to a spectacular sunny day with Colorado clouds making picture-taking a dream. This was the trip where my rock/mineral collection grew. Fortunately I was able to high-grade as we went along, but still I ended up with 8-10 baseball size specimens.

The field trip season is winding down for the calendar year, but the field trip committee will be organizing Spring and Summer 2024 field trips which will be posted as they are finalized. If you have any suggestions please bring them forward to either Jim Corken or myself.

Best regards,

*Chris*



## **Pun of the month:**

What did Sherlock Holmes say when Watson asked what type of rock he was holding? "Sedimentary, my dear Watson".



# FCGS NEWS YOU CAN USE

## In the News:

### AI-driven earthquake forecasting shows promise in trials' (from Science Daily)

Date: October 5, 2023

Source: University of Texas at Austin

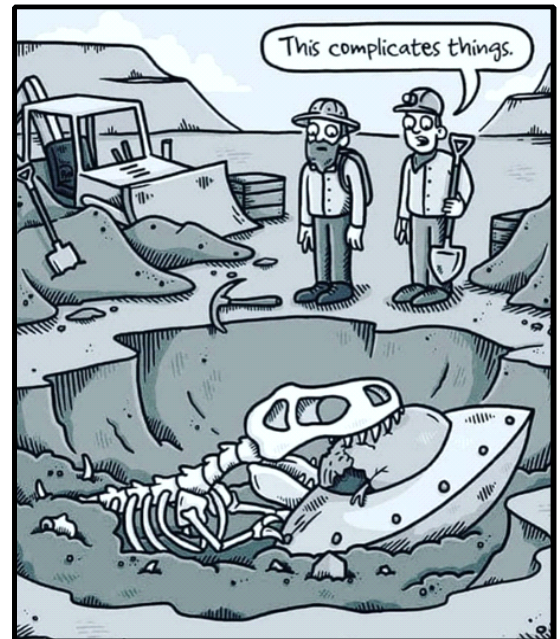
"A new attempt to predict earthquakes has also raised hopes that artificial intelligence could one day be used to limit earthquakes' impact on lives and economies. The AI algorithm correctly predicted 70% of earthquakes a week before they happened during a seven-month trial in China. The system is limited because the AI needs an extensive database and years of seismic recordings to train itself on, but researchers said the effort is nonetheless a milestone for AI-driven earthquake forecasting. Researchers will soon begin testing the system at other locations."

- Chris Heine



**AND.....**

### *In Keeping with The Morrison Field Trip:*



**SAVE THE DATES!**

November 16, 2023:	Bethany Burke
December 7, 2023:	FLC Geo Students
<b>2024</b>	
January 18:	Kitty Milliken
February 22:	Peter Vrolijk
March 28:	Chip Head
April 18:	FLC Student Presentations
May 16:	Doug Bartlett



**Four Corners Geological Society, P.O. Box 1501, Durango, CO 81302**  
**[www.fourcornersgeologicalsociety.org](http://www.fourcornersgeologicalsociety.org)**

# FCGS FIELD TRIPS

*Ironton*





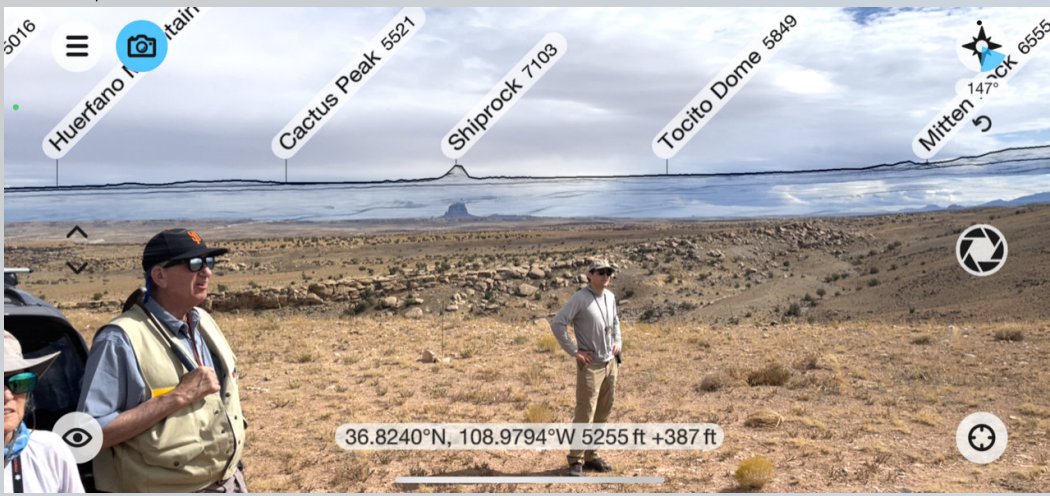
# FCGS FIELD TRIPS

*Ironton*





# FCGS FIELD TRIPS



*Jurassic Morrison*



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# FCGS FIELD TRIPS



*Jurassic Morrison*



# REGIONAL NEWS

## **GJGS October Meeting**

**Wednesday, October 18, 2023; 7:30 PM; In-Person and Virtual**

Joint meeting with the CMU Geology Students

Saccomanno Lecture Hall, (Room 131 in the Wubben-Science Building), Grand Junction, CO

David Lipson, Ph.D., C.P.G., HRS Water Consultants, Inc., Lakewood, CO

### ***“Hydrogeology Careers in the 21st Century”***

Abstract:

Hydrogeology is a branch of geology that deals with the distribution and movement of groundwater in soil and rock layers of the Earth’s crust, and the ways in which humans interact with groundwater through either natural or engineered systems. Hydrogeology is a multidisciplinary field and, in order to be well-rounded hydrogeologists, students must master a variety of topics including geology, hydrology, chemistry, biology, fluid dynamics, and other topics. Some of the main concerns in hydrogeology include water supply, water quality, groundwater-surface water interactions, waste disposal, groundwater contamination, and construction of structures that interact with groundwater.

21st-century societies are faced with large-scale and long-lasting global problems such as population growth, aging infrastructure, and climate change, which will drive the need for evergreater progress and innovation in hydrogeology for the foreseeable future. Clean water for people is a necessity for life and a basic human right. Yet the Earth’s water resources are constantly under pressure from these global-scale problems. The good news is that the scientific advances of the past 50 years will enable early-career hydrogeologists to solve water problems over the next 50 years.

There is a tremendous need for hydrogeologic expertise in the 21st century and people with a passion for solving water problems are and will continue to be in high demand. Dr. Lipson’s talk will draw from his more than 33 years of experience solving groundwater problems around the US and internationally. During his talk, he will describe different types of careers that are available for hydrogeologists, highlight different kinds of water problems that need to be solved now, and provide career advice on how to be a successful hydrogeologist in the 21st century.

Join Zoom Meeting: <https://coloradomesa.zoom.us/j/96837530667>

Meeting ID: 968 3753 0667

Note: The Zoom meeting opens a half-hour before the actual meeting starts so that people have time to log in if not attending in person.



# REGIONAL NEWS

## **RMAG On The Rocks: Red Rock Canyon Open Space Tour Saturday, October 28, 2023 Red Rock Canyon Open Space, Manitou Springs , CO**

Join us for the final On the Rocks Field Trip in 2023 when we visit Red Rock Canyon Open Space near Manitou Springs, CO. The trip has something for everyone: stratigraphy, structure, sedimentary structures, fossils, historic quarry remains in the Lyons Sandstone, and a geologic traverse from the Pierre Shale to the Fountain Formation. The steeply dipping stratigraphy in the Open Space affords an opportunity to examine all the lithologies exposed.

Our field trip leader, Sharon Milito, has the distinction of being the RMAG Teacher of the Year in 2011 and the first person to find a fossil skull in a concretion in Corral Bluffs, an outstanding collection of Paleocene fossils representing development of mammals, insects, and plants following the K-Pg Chicxulub asteroid impact. Sharon is a co-author of an extensive publication on the Red Rock Canyon Open Space and will lead us to the many geologic sites of interest.

To register or get more trip info, go to

<https://www.rmag.org/index.php?src=events&submenu=Events&srctype=detail&category=Field%20Trips&refno=304>



September FCGS Meeting





# FOUR CORNERS GEOLOGICAL SOCIETY

P.O. Box 1501, Durango, CO 81302

**MEMBERSHIP RENEWAL or APPLICATION: June 1, 2023 to May 31, 2024**



\*Name: \_\_\_\_\_

\*Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

\*Email: \_\_\_\_\_ Phone: \_\_\_\_\_

\*Employer: \_\_\_\_\_

### Please Identify a Membership Category:

**\*Please check your interests:**

- Sedimentology & stratigraphy
- Structure & tectonics
- Mineralogy, petrology, geochemistry
- Igneous geology, volcanology
- Ore geology and hard rock mining
- Other mineral extraction
- Petroleum geology
- Geophysics
- Geological engineering
- Geomorphology
- Quaternary geology
- Hydrology & water resources
- Environmental geology
- Geography / GIS
- Other interest (see box)

<b>Active Member</b>	\$30	Any person engaged in the practice or teaching of geology or who holds a Bachelor's Degree in geological science from a college of acceptable academic standards. Degree requirement may be waived if applicant has adequate professional experience. <i>*Highest Degree, Type and Year: _____</i> <i>*College / University: _____</i>
<b>Associate Member</b>	\$30	Any person who is a graduate of a college of acceptable academic standards with major studies related to, or associated with, geology. Degree requirement may be waived if applicant has adequate professional experience. <i>*Highest Degree, Type and Year: _____</i> <i>*College / University: _____</i>
<b>Student Member</b>	Free	Any undergraduate or graduate student majoring in geology at a college of acceptable academic standards. <i>*College / University: _____</i> <i>*Year expected to graduate: _____</i>
<b>Emeritus Member</b>	Free	An Active Member of 65 years old or older who has been a member for 25 years including time spent in military service. <i>*Year emeritus status was awarded: _____</i>
<b>Honorary Member</b>	Free	An Active Member who has contributed distinguished service to the profession of geology and to the betterment of the FCGS. Determination is made by the FCGS Executive Committee. <i>*Year honorarium was awarded: _____.</i>

**Other Professional Interests or Comments and Concerns.**

**Are you interested in Volunteering? If so, what is your area of interest?**

*\* Required information for new members. Current Members, please update.*

**Please either print, complete and return this form with your check for dues made payable to: "Four Corners Geological Society" and mail to the address above or go online to [fourcornersgeologicalsociety.org](http://fourcornersgeologicalsociety.org) .**